Programmers Aid for ATARI® Computers $3.98

Reg.™ A Warner Communications Company

BASIC KEYWORDS

Word	Token	Word	Token
ABS	79	Next	9
ADR	67	NOT	40
AND	42	NOte	27
ASC	64	ON	30
ATN	68	Open	23
Bye	14	OR	41
CLOAd	53	PADDLE	81
CHR$	62	PEEK	70
CLOG	76	PLot	44
CLose	17	Point	28
CLR	18	POKe	31
Color	3	POP	39
COM	16	POSition	45
CONt	15	PRint	32
COS	69	PTRIG	83
CSAVE	52	PUt	42
Data	1	RAD	33
DEg	19	REAd	34
DIm	20	Rem	0
DOs	46	RESTore	35
DRawto	47	RETurn	36
END	21	RND	72
Enter	5	RUn	37
EXP	74	Save	25
For	8	SEtcolor	48
FRE	73	SGN	78
GEt	41	SIN	71
GOSub	12	SOund	50
Goto	10	SQR	77
GRaphics	43	STatus	26
IF	7	STEP	26
Input	2	STICK	82
INT	80	STRIG	84
LEN	66	STOp	38
LEt	6	STR$	61
List	4	THEN	27
LOad	24	TO	25
LOCate	49	Trap	13
LOG	75	USR	63
LPrint	51	VAL	65
NEW	22	Xio	29

MUSICAL NOTES / PITCH VALUES

high notes	C	29
	B	31
	A# or Bb	33
	A	35
	G# or Ab	37
	G	40
	F# or Gb	42
	F	45
	E	47
	D# or Eb	50
	D	53
	C# or Db	57
	C	60
	B	64
	A# or Bb	68
	A	72
	G# or Ab	76
	G	81
	F# or Gb	85
	F	91
	E	96
	D# or Eb	102
	D	108
	C# or Db	114
middle	C	121
	B	128
	A# or Bb	136
	A	144
	G# or Ab	153
	G	162
	F# or Gb	173
	F	182
	E	193
	D# or Eb	204
	D	217
low notes	C# or Db	230
	C	243

ADDITIONAL USER NOTES:
(USE PERMANENT MARKER TO PRESERVE)

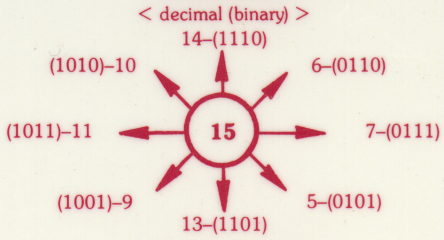
ERROR MESSAGES

Code	Message
2	Memory Insufficient
3	Value Error
4	Too Many Variables
5	String Length Error
6	Out of Data Error
7	Number greater than 32767
8	Input Statement Error
9	Array or String DIM Error
10	Argument Stack Overflow
11	Floating Point Overflow/Underflow Error
12	Line Not Found
13	No Matching FOR Statement
14	Line Too Long Error
15	GOSUB or FOR Line Deleted
16	RETURN Error
17	Garbage Error
18	Invalid String Character
Input/Output Errors	
19	LOAD Program Too Long
20	Device Number Larger
21	LOAD File Error
128	BREAK Abort
129	IOCB
130	Nonexistent Device
131	IOCB Write Only
132	Invalid Command
133	Device or File not Open
134	Bad IOCB Number
135	IOCB Read Only Error
136	EOF
137	Truncated Record
138	Device Timeout
139	Device NAK
140	Serial Bus
141	Cursor Out of Range
142	Serial Bus Data Frame Overrun
143	Serial Bus Data Frame Checksum Error
144	Device Done Error
145	Read after Write Compare Error
146	Function not Implemented
147	Insufficient RAM
160	Drive Number Error
161	Too Many OPEN Files
162	Disk Full
163	Unrecoverable System Data I/O Error
164	File Number Mismatch
165	File Name Error
166	POINT Data Length Error
167	File Locked
168	Command Invalid
169	Directory Full
170	File not Found
171	POINT Invalid

ATARI HUES

Value	Color	Value	Color
0	Grey	8	Blue
1	Gold	9	Light Blue
2	Orange	10	Turquoise
3	Red-Orange	11	Green-Blue
4	Pink	12	Green
5	Purple	13	Yellow-Green
6	Purple-Blue	14	Orange-Green
7	Blue	15	Light Orange

JOYSTICK



OPERATORS

highest precedence:

Token	Oper.	Meaning
50	<	Relational operators used in string expressions
51	>	
52	=	
47	<=	
49	>=	
48	<>	
54	–	Negation
35	^	Exponentiation
36	*	Multiplication
39	/	Division
37	+	Addition
38	–	Substraction
32	<	Relational operators used in numeric expressions
33	>	
34	=	
29	<=	
31	>=	
30	<>	
40	NOT	Unary Operator
42	AND	Logical AND
41	OR	Logical OR

DEFAULT COLORS

SETCOLOR register	Color value	Lum value	Color
0	2	8	Orange
1	12	10	Green
2	9	4	Dark Blue
3	4	6	Pink
4	0	0	Black

MODE/COLOR TABLE

Color	Mode	SETCOL.	COLOR	Application
– –		0	COLOR	– –
Light Green	Mode 0	1	deter-	Char. Luminance
Dark Blue	and	2	mines	Background
– –	Text	3	character	– –
Black	Windows	4	plotted	Border
Orange		0	COLOR	Character
Light Green	Modes	1	deter-	Character
Dark Blue	1	2	mines	Character
Red	and	3	character	Character
Black	2	4	plotted	Background, Border
Orange	Modes 3,	0	1	Graphics Point
Light Green	5, & 7	1	2	Graphics Point
Dark Blue	(Four	2	3	Graphics Point
– –	color	3	– –	– –
Black	modes)	4	0	Gr. Point, Bkgd., Border
Orange	Modes	0	1	Graphics Point
– –	4 & 6	1	– –	– –
– –	(Two	2	– –	– –
– –	color	3	– –	– –
Black	modes)	4	0	Gr. Point, Bkgd., Border
– –	Mode 8	0	– –	– –
Light Green	1 color	1	1	Gr. Point Luminance
Dark Blue	and	2	0	Gr. Point, Background
– –	2 lum.	3	– –	– –
Black		4	– –	Border

ANTIC MODES and SCREEN FORMATS

ANTIC Opcode		BASIC Mode	Char or Bitmap	Number of Colors	X x Y ColumnsxRows	Pixel Size HorxVert	Bytes per Line/Screen
$2	2	0	Char	2	40 x 24	8 x 8	40/960
$3	3	--	Char	2	40 x 19	8 x 10	40/760
$4	4	--	Char	4	40 x 24	8 x 8	40/960
$5	5	--	Char	4	40 x 12	8 x 16	40/480
$6	6	1	Char	5	20 x 24	16 x 8	20/480
$7	7	2	Char	5	20 x 12	16 x 16	20/240
$8	8	3	Bit	4	40 x 24	8 x 8	10/240
$9	9	4	Bit	2	80 x 48	4 x 4	10/480
$A	10	5	Bit	4	80 x 48	4 x 4	20/960
$B	11	6	Bit	2	160 x 96	2 x 2	20/1920
$C	12	--	Bit	2	160 x 192	2 x 1	20/3840
$D	13	7	Bit	4	160 x 96	2 x 2	40/3840
$E	14	--	Bit	4	160 x 192	2 x 1	40/7680
$F	15	8	Bit	2	320 x 192	1 x 1	40/7680

ANTIC BLANK-LINE OPCODES

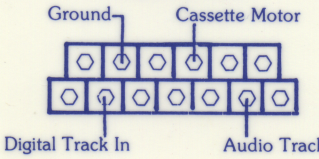
Number of Blank Lines	Opcode
1	0 ($00)
2	16 ($10)
3	32 ($20)
4	48 ($30)
5	64 ($40)
6	80 ($50)
7	96 ($60)
8	112 ($70)

ANTIC INSTRUCTION MODIFIERS

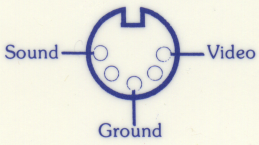
Instruction Type	Scroll Hor	Scroll Vert	LMS	DLI
blank lines	--	--	--	+128 ($80)
char/graphics	+16 ($10)	+32 ($20)	+64 ($40)	+128 ($80)
JMP =1 ($1)	--	--	--	+128 ($80)
JVB =65 ($41)	--	--	--	+128 ($80)

CONNECTOR PINOUTS

Peripheral Jack



Monitor Jack



FREE RAM IN PAGE ZERO

176-202 ($B0-$CA)	free in Assembler
203-207 ($CB-$CF)	free in BASIC & Assem
208-209 ($D0-$D1)	free in BASIC
212-255 ($D4-$FF)	free in Assembler

FREE RAM ELSEWHERE

1536-1791 ($600-$6FF), and from value in BASIC MEMTOP, 144,145 ($90,$91), to value in OS MEMTOP, 741,742 ($2E5,$2E6).

OPERATING SYSTEM ENTRY POINTS

Label	decimal	Location-hex	Function
DSKINV	58448	E450	Disk Handler init
DISKV	58451	E453	Disk Handler
CIOV	58454	E456	Central I/O utility
SIOV	58457	E459	Serial I/O utility
SETVBV	58460	E45C	Set System Timers
SYSVBV	58463	E45F	First stage VBLANK
XITVBV	58466	E462	Exit VBLANK
SIOINV	58469	E465	SIO utility init
SENDEV	58472	E468	Send enable
INTINV	58475	E46B	Interrupt Handler init
CIOINV	58478	E46E	CIO utility unit
BLKBDV	58481	E471	Memo Pad mode
WARMSV	58484	E474	Warmstart (RESET button)
COLDSV	58487	E477	Coldstart (power-up)

FLOATING POINT ROM ENTRY POINTS

AFP	55296	D800	ASCII to FP conversion
FASC	55526	D8E6	FP to ASCII conversion
IFP	55722	D9AA	Integer to FP conversion
FPI	55762	D9D2	FP to Integer conversion
ZFRO	55876	DA44	Clear FP register 0
ZF1	55878	DA46	Clear FP number
FSUB	55904	DA60	Floating Point Subtract
FADD	55910	DA66	Floating Point Add
FMUL	56027	DADB	Floating Point Multiply
FDIV	56104	DB28	Floating Point Divide
PLYEVL	56640	DD40	FP Polynomial Evaluation
FLDOR	56713	DD89	Load FP number
FLDOP	56717	DD8D	Load FP number
FLD1R	56728	DD98	Load FP number
FLD1P	56732	DD9C	Load FP number
FSTOR	56743	DDA7	Store FP number
FSTOP	56747	DDAB	Store FP number
FMOVE	56758	DDB6	Move FP number
EXP	56768	DDC0	FP Base e Exponentiation
EXP10	56780	DDCC	FP Base 10 Exp.
LOG	57037	DECD	FP Natural Logarithm
LOG10	57041	DED1	FP Common Logarithm

IMPORTANT MEMORY LOCATIONS---RAM

Label	decimal	Location-hex	Function
RTCLOCK	18,19,20	12,13,14	Internal Clock
ICxxxx	32-47	20-2F	Page Zero IOCB
SOUNDR	65	41	Noisy I/O flag (0=quiet)
ATRACT	77	4D	Attract Mode flag (128=Attract Mode)
LMARGIN	82	52	Left Margin (default=2)
RMARGIN	83	53	Right Margin (default=39)
ROWCRS	84	54	Current Graphics Cursor Row
COLCRS	85,86	55,56	Current Graphics Cursor Column
CRMODE	87	57	BASIC Graphics Mode (0-8)
SAVMSC	88,89	58,59	Lowest Address of Screen Memory
OLDROW	90	5A	Previous Graphics Cursor Row
OLDCOL	91,92	5B,5C	Previous Graphics Cursor Column
NEWROW	96	60	Row to which DRAWTO will go
NEWCOL	97,98	61,62	Column to which DRAWTO will go
RAMTOP	106	6A	Actual Top of RAM (in pages)
LOMEN	128,129	80,81	BASIC Low Memory pointer
VNTP	130,131	82,83	Variable Name Table beginning address
VNTD	132,133	84,85	Variable Name Table ending address+1
VVTP	134,135	86,87	Variable Value Table address
STMTAB	136,137	88,89	Statement Table address
STARP	140,141	8C,8D	String Array Table address
MEMTOP	144,145	90,91	BASIC Top of Memory Used pointer
STOPLN	186,187	BA,BB	Line Number of STOP or TRAP
ERRSAVE	195	C3	Error Number causing STOP or TRAP
PTABW	201	C9	PRINT Tab Width (default=10)
FRO	212-217	D4-D9	Floating Point Register 0
—	212,213	D4,D5	Value returned by USR function
FR1	224,229	E0-E5	Floating Point Register 1
VDSLST	512,513	200,201	Display List Interrupt Vector
VBREAK	518,519	206,207	BREAK Vector
CDTMV1-5	536-545	218-221	System Timer 1-5 values (low,high)
VVBLKI	546,547	222,223	Vert. Blank Int. vector (immediate)
VVBLKD	548,549	224,225	Vert. Blank Int. vector (deferred)
CDTMA1	550,551	226,227	System Timer 1 time-out jump address
CDTMA2	552,553	228,229	System Timer 2 time-out jump address
CDTMF3-5	554,6,8	22A,C,E	System Timer 3-5 time-out flags
SDMCTL	559	22F	DMA enable (0=off) shadow
SDLSTL	560,561	230,231	Display List Pointer shadow
LPENH	564	234	Light Pen Horizontal Position
LPENV	565	235	Light Pen Vertical Position
COLDST	580	244	1 = Coldstart on RESET
GPRIOR	623	26F	Priority Control shadow
PADDLO-7	624-631	270-277	Values of Paddle 0-7
STICKO-3	632-635	278-27B	Values of Joystick 0-3
STRIGO-3	644-647	284-287	Joystick Button 0-3 (0=pressed)
TXTROW	656	290	Text Cursor Row
TXTCOL	657,658	291,292	Text Cursor Colum
TXTMSC	660,661	294,295	Top left corner of Text Window
BOTSCR	703	2BF	Number of Text Rows (0,4, or 24)
PCOLRO-3	704-707	2C0-2C3	Color of Player/Missile 0-3
COLOR0-4	708-712	2C4-2C8	SETCOLOR registers 0-4
MEMTOP	741,742	2E5,2E6	OS Top of Memory pointer
MEMLO	743,744	2E7,2E8	OS Bottom of Memory pointer
CRSINH	752	2F0	Cursor Inhibit (0=cursor on)
CHACT	755	2F3	Character Mode Register
CHBAS	756	2F4	Character Set Base Register
CH	764	2FC	Last Key Pressed (internal code)

IMPORTANT MEMORY LOCATIONS---HARDWARE REGISTERS

(XXX) indicates RAM shadow address **W=write** **R=read**

HPOSP0-3	53248-53251	D000-D003	W–Player 0-3 Horizontal Position
M0-3PF	53248-53251	D000-D003	R–Missile 0-3/Playfield Collision
HPOSM0-3	53252-53255	D004-D007	W–Missile 0-3 Horizontal Position
P0-3PF	53252-53255	D004-D007	R–Player 0-3/Playfield Collision
SIZEP0-3	53256-53259	D008-D00B	W–Size of Player 0-3
M0-3PL	53256-53259	D008-D00B	R–Missile 0-3/Player Collision
SIZEM	53260	D00C	W–Sizes for Missiles
P0-3PL	53260-53263	D00C-D00F	R–Player 0-3/Player Collision
GRAFP0-3	53261-53264	D00D-D010	W–Player 0-3 Graphics Data
TRIG0-3	53264-53267	D010-D013	R–(644-647) Joystick Button 0-3
GRAFM	53265	D011	W–Graphics for Missiles
COLPM0-3	53266-53269	D012-D015	W–(704-707) Player/Missile 0-3 Color
COLPF0-3	53270-53273	D016-D019	W–(708-711) Playfield 0-3 Color
COLBK	53274	D01A	W–(712) Background Color & Lum
PRIOR	53275	D01B	W–(623) Priority Control
VDELAY	53276	D01C	W–Vertical Delay
GRACTL	53277	D01D	W–Graphics Control
HITCLR	53278	D01E	W–Clear the Collision Registers
CONSOL	53279	D01F	R–START/SELECT/OPTION Buttons
CONSOL	53279	D01F	W–Click Console Speaker
AUDF1-4	53760,2,4,6,	D200,2,4,6	W–Audio Channel 1-4 Frequency
AUDC1-4	53761,3,5,7	D201,3,5,7	W–Audio Channel 1-4 Control
AUDCTL	53768	D208	W–Audio Control
KBCODE	53769	D209	R–(764) Keyboard Code
RANDOM	53770	D20A	R–Random Number Generator
PORTA,B	54016,54017	D300,D301	Controller Jacks 1 & 2
PA,BCTL	54018,54019	D302,D303	Port A and B Control
DMACTL	54272	D400	W–(559) DMA Control
CHACTL	54273	D401	W–(755) Character Control
DLISTL,H	54274,54275	D402,D403	W–(560,561) Display List pointer
HSCROL	54276	D404	W–Horizontal Scroll value
VSCROL	54277	D405	W–Vertical Scroll value
PMBASE	54279,54280	D407,D408	W–Player/Missile Base Address
CHBASE	54281	D409	W–(756) Character Base Address
WSYNC	54282	D40A	W–Wait for Horizontal Sync
VCOUNT	54283	D40B	R–Vertical Line Counter
NMIEN	54286	D40E	W–NMI Interrupt Enable